PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-314856
(43)Date of publication of application : 06.11.2003

(51)Int.Cl. F24F 3/14
B01D 53/26
F24F 3/147
F24F 7/08
F25B 21/02
F25B 39/00

(21)Application number : 2002-119186
(22)Date of filing : 22.04.2002
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(54) HUMIDITY CONTROL EQUIPMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a humidity control equipment, which controls humidity of air by using adsorbent, wherein energy required for its operation is decreased, while avoiding degradation of humidity control performance.
SOLUTION: An absorbing and desorbing unit 60 is provided in a flat casing 11. The absorbing and desorbing unit 60 consists of a Peltier element 61 and two absorbing members 62, 65. For the Peltier element, a first absorbing member 62 is attached on its upper face and a second absorbing member 65 is attached on its lower face. Each absorbing member 62, 65 is formed in a heat dump shape and absorbent is coated on its surface. The first absorbing member 62 contacts with air passing through a first air passage 51 and the second absorbing member 65 contacts with air passing through a second air passage 52.

PRIOR ART

[Description of the Prior Art]Conventionally, the humidity controller which dehumidifies air using adsorbent is known as indicated by JP,62-68520,A. The adsorbing element which it is formed in the shape of a rotor, and is rotated is provided in this humidity controller. Many passages of the air (air to be dehumidified) dehumidified are formed in this adsorbing element. And air to be dehumidified contacts adsorbent, while passing through the passage of an adsorbing element, and it is adsorbed by adsorbent in the moisture contained in air to be dehumidified. When adsorbent is adsorbed in moisture, heat of adsorption occurs. So, in the above-mentioned humidity controller, the air duct for cooling is also formed in an adsorbing element, and the generated heat of adsorption is processed.
[0003]Reproduction of an adsorbing element is performed in the above-mentioned humidity controller. Specifically, the air for reproduction heated with warmers, such as an electric heater, is supplied to the adsorbing element. The adsorbent of an adsorbing element is heated by contacting the hot air for reproduction. And it is desorbed from moisture from the heated adsorbent, and an adsorbing element is reproduced.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the above-mentioned humidity controller, when reproducing an adsorbing element, the air for reproduction heated with the electric heater etc. is supplied to an adsorbing element, and the adsorbing element is indirectly heated with the heated air for reproduction. For this reason, there is a problem that energies, such as electric power which reproduction of an adsorbing element takes compared with the case where adsorbent is heated directly, with an electric heater etc., increase.

[0005]To this problem, adsorbent is formed, for example in the surfaces, such as an electric heater, and the measure of heating adsorbent directly and desorbing moisture from adsorbent can be considered. when such a measure is taken, it becomes impossible however, to process the heat of adsorption generated when adsorbent is alike and moisture adsorbs For this reason, the moisture content which can be made to stick to adsorbent decreases, and the problem that the gas conditioning capability of a humidity controller declines arises.

[0006]this invention is made in view of this point, and comes out. The purpose is in reducing the energies which operation of a humidity controller takes, avoiding that the gas conditioning capability of ** declines.

EFFECT OF THE INVENTION

[Effect of the Invention]In this invention, adsorbent is formed on the surface of an adsorbing member (62, 65), and this adsorbent is directly heated by the adsorbing member (62, 65). For this reason, it becomes possible to heat adsorbent certainly by small quantity of heat, and to desorb moisture from adsorbent compared with the conventional thing which heats adsorbent indirectly using the heated air. Therefore, according to this invention, the energies which can reduce the energies which reproduction of an adsorbing member (62, 65) takes, and operation of a humidity controller (10) takes by extension are reducible.

[0089]the adsorbent formed in the surface in the adsorbing member (62, 65) of this invention -- cooling -- **** . For this reason, the heat of adsorption generated when adsorbent is adsorbed in moisture is processed by an endothermic being carried out to an adsorbing member (62, 65). Therefore, according to this invention, the gas conditioning capability of a humidity controller (10) can fully be demonstrated by being able to prevent moisture from becoming adsorbent that it is hard to adsorb, and securing the moisture content which can stick to adsorbent with the generated heat of adsorption.

[0090]According to the invention of claim 2, the whole humidity controller (10) can be formed in a thin shape. Therefore, according to this invention, the humidity controller (10) which can be installed also, for example in narrow space called space under the roof can be realized, and the restrictions at the time of installing a humidity controller (10) can be made small.

[0091]According to the invention of claim 3, heating and cooling of adsorbent in an adsorbing member (62, 65) can be performed only by energizing to a thermoelement (61). Therefore, according to this invention, a reliable humidity controller (10) is realizable.

[0092]According to the invention of claim 5, the air supply to the interior of a room can be dehumidified, performing indoor ventilation. According to the invention of claim 6, the air supply to the interior of a room can be humidified, performing indoor ventilation. Therefore, according to these inventions, gas conditioning of air supply and indoor ventilation can be performed simultaneously, and the indoor amenity can be raised.

[0093]In the invention of claim 7, the sensible-heat-exchange machine (80) is formed in the humidity controller (10) in which indoor ventilation is possible. For this reason, it becomes possible to collect the cold energy under exhaust air to air supply, for example, if it is during indoor air conditioning, or to collect the warm temperature under exhaust air to air supply, if it is during indoor heating. Therefore, according to this invention, it becomes possible to control increase of the sensible heat load accompanying ventilation.

MEANS

[Means for Solving the Problem]An invention of claim 1 is aimed at a humidity controller which supplies air to be dehumidified or humidified humidified air which incorporated air to be dehumidified and humidified air and was dehumidified to the interior of a room. And it has two or more adsorbing members (62, 65) for performing cooling and heating of adsorbent which were formed in the surface, The 1st

operation contacted to humidified air heating adsorbent in the 2nd adsorbing member (65) at the same time it makes air to be dehumidified contact, cooling adsorbent in the 1st adsorbing member (62), By the 2nd adsorbing member (65), by the 1st adsorbing member (62), heating adsorbent, the 2nd operation contacted to humidified air is repeated by turns, and is performed at the same time it makes air to be dehumidified contact, cooling adsorbent.

[0008]While an air breathing mouth (13, 16) and every one outlet (14, 17) equip each of the side of a couple which is formed in flat rectangular parallelepiped shape and counters in the humidity controller according to claim 1 with a casing (11) which carries out an opening, an invention of claim 2 inside the above-mentioned casing (11), Are divided so that the 1st air duct (51) in which the 1st adsorbing member (62) was installed, and the 2nd air duct (52) in which the 2nd adsorbing member (65) was installed may adjoin mutually in a thickness direction of this casing (11), and. A change mechanism (30) for switching to the state of opening for free passage each of a suction opening (13, 16) which carries out an opening to these every two casings (11), and an outlet (14, 17) to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52) is stored.

[0009]An invention of claim 3 is provided with a thermoelement (61) to which both the 1st adsorbing member (62) and the 2nd adsorbing member (65) were attached in the humidity controller according to claim 1 or 2, the above-mentioned thermoelement (61) -- the 1st -- carrying out an endothermic from the 1st adsorbing member (62) working, and radiating heat to the 2nd adsorbing member (65) -- the 2nd -- an endothermic is carried out from the 2nd adsorbing member (65) working, and heat is radiated to the 1st adsorbing member (62).

[0010]An invention of claim 4 is provided with a refrigerant circuit (70) which circulates a refrigerant with which it filled up in the humidity controller according to claim 1 or 2, and performs a refrigerating cycle, At least one of two or more heat exchangers provided in the above-mentioned refrigerant circuit (70) constitutes the 1st adsorbing member (62), and the remainder constitutes the 2nd adsorbing member (65), In the above-mentioned refrigerant circuit (70) under 1st operation, a heat exchanger which constitutes the 1st adsorbing member (62) turns into an evaporator, and a heat exchanger which constitutes the 2nd adsorbing member (65) turns into a condenser, In the above-mentioned refrigerant circuit (70) under 2nd operation, a heat exchanger which constitutes the 1st adsorbing member (62) turns into a condenser, and a heat exchanger which constitutes the 2nd adsorbing member (65) turns into an evaporator.

[0011]At the same time an invention of claim 5 dehumidifies outdoor air incorporated as air to be dehumidified by an adsorbing member (62, 65) in the humidity controller according to claim 1 or 2 and supplies it to the interior of a room, Operation which discharges to outdoor indoor air incorporated as humidified air with moisture desorbed from adsorbent of an adsorbing member (62, 65) is constituted possible.

[0012]At the same time an invention of claim 6 supplies outdoor air incorporated as humidified air to the interior of a room in the humidity controller according to claim 1 or 2 with moisture desorbed from adsorbent of an adsorbing member (62, 65), Operation which dehumidifies indoor air incorporated as air to be dehumidified by an adsorbing member (62, 65), and is discharged to outdoor is constituted possible.

[0013]An invention of claim 7 is provided with a sensible-heat-exchange machine (80) for carrying out heat exchange of the humidified air before contacting air to be dehumidified after contacting an adsorbing member, and adsorbent in the humidity controller according to claim 5 or 6.

[0014]- In an invention of operation-claim 1, two or more adsorbing members (62, 65) are provided in a humidity controller (10). Adsorbent is formed in the surface of each adsorbing member. In each adsorbing member (62, 65), cooling and heating of adsorbent which were formed in the surface are performed.

[0015]In a humidity controller (10) of this invention, the 1st operation and the 2nd operation are performed repeatedly by turns. In the 1st operation, adsorbent of the 1st adsorbing member (62) is adsorbed in moisture in the air to be dehumidified. As for heat of adsorption generated in that case, the 1st adsorbing member (62) carries out the endothermic of this. In this 1st operation, adsorbent is heated by the 2nd adsorbing member (65), and moisture desorbed from this adsorbent is given to humidified air. On the other hand, in the 2nd operation, adsorbent of the 2nd adsorbing member (65) is adsorbed in moisture in the air to be dehumidified. As for heat of adsorption generated in that case, the 2nd adsorbing member (65) carries out the endothermic of this. In this 2nd operation, adsorbent is heated by the 1st adsorbing member (62), and moisture desorbed from this adsorbent is given to humidified air.

[0016]And a humidity controller (10) of this invention performs the 1st operation and the 2nd operation by turns, and supplies dehumidified air to be dehumidified or humidified humidified air to the interior of a room. Only operation which supplies dehumidified air to be dehumidified to the interior of a room may be

possible for this humidity controller (10), and only operation which supplies humidified humidified air to the interior of a room may be possible for it. This humidity controller (10) may switch operation which supplies dehumidified air to be dehumidified to the interior of a room, and operation which supplies humidified humidified air to the interior of a room, and may be performed.

[0017]In an invention of claim 2, an adsorbing member (62, 65) and a change mechanism (30) are stored by casing (11) of flat rectangular parallelepiped shape. In this casing (11), an air breathing mouth (13) and every one outlet (14) carry out an opening to one side among the sides of a couple which counters mutually, and an air breathing mouth (16) and every one outlet (17) are carrying out the opening also to the side of another side. That is, an air breathing mouth (13, 16) and every two outlets (14, 17) are provided in this casing (11).

[0018]As for a casing (11) provided in a humidity controller (10) of this invention, section forming of the 1st air duct (51) and the 2nd air duct (52) is carried out to the inside. The 1st air duct (51) and the 2nd air duct (52) adjoin each other mutually in a thickness direction of a flat casing (11). And the 1st adsorbing member (62) is provided in the 1st air duct (51), and the 2nd adsorbing member (65) is provided in the 2nd air duct (52).

[0019]When a humidity controller (10) of this invention operates a change mechanism (30), The state where one side of a suction opening (13, 16) provided in two casings (11) is open for free passage to the 1st air duct (51), and another side is open for free passage to the 2nd air duct (52), and the state where one of these is open for free passage to the 2nd air duct (52), and another side is open for free passage to the 1st air duct (51) are switched. When this humidity controller (10) operates a change mechanism (30), The state where one side of an outlet (14, 17) provided in two casings (11) is open for free passage to the 1st air duct (51), and another side is open for free passage to the 2nd air duct (52), and the state where one of these is open for free passage to the 2nd air duct (52), and another side is open for free passage to the 1st air duct (51) are switched.

[0020]In an invention of claim 3, a thermoelement (61) is provided in a humidity controller (10). Both the 1st adsorbing member (62) and the 2nd adsorbing member (65) are attached to this thermoelement (61). During operation of a humidity controller (10), it energizes to this thermoelement (61). and the 1st -- if working, a thermoelement (61) will carry out an endothermic from the 1st adsorbing member (62), and will radiate heat to the 2nd adsorbing member (65) -- the 2nd -- if working, a thermoelement (61) will carry out an endothermic from the 2nd adsorbing member (65), and will radiate heat to the 1st adsorbing member (62).

[0021]In an invention of claim 4, a refrigerant circuit (70) is established in a humidity controller (10). At least one of them becomes the 1st adsorbing member (62), and, as for two or more heat exchangers provided in a refrigerant circuit (70), the remainder serves as the 2nd adsorbing member (65). And during the 1st operation, a refrigerant radiates heat and condenses by a heat exchanger which constitutes the 2nd adsorbing member (65), and in a heat exchanger which constitutes the 1st adsorbing member (62), a refrigerant carries out an endothermic and evaporates. On the other hand, during the 2nd operation, a refrigerant radiates heat and condenses by a heat exchanger which constitutes the 1st adsorbing member (62), and in a heat exchanger which constitutes the 2nd adsorbing member (65), a refrigerant carries out an endothermic and evaporates.

[0022]In an invention of claim 5, operation which discharges to outdoor indoor air incorporated as humidified air is performed at the same time it supplies the interior of a room after dehumidifying outdoor air incorporated as air to be dehumidified. That is, when performing indoor ventilation, operation which dehumidifies air supply for ventilation is performed.

[0023]In an invention of claim 6, operation which discharges to outdoor indoor air incorporated as air to be dehumidified is performed at the same time it supplies the interior of a room after humidifying outdoor air incorporated as humidified air. That is, when performing indoor ventilation, operation which humidifies air supply for ventilation is performed.

[0024]In an invention of claim 7, a sensible-heat-exchange machine (80) is formed in a humidity controller (10). In this sensible-heat-exchange machine (80), air to be dehumidified before being dehumidified, and humidified air after being humidified perform heat exchange.

[0025]

[Embodiment of the invention 1] Hereafter, an embodiment of this invention is described in detail based on a drawing.

[0026]First, Embodiment 1 of this invention is described, referring to drawing 1 - drawing 4 suitably. in addition -- in explanation of this Embodiment 1 -- "-- upper" -- "-- lower", the "left", and the "right" -- "--

front" -- "-- especially back", "this side", and the "back" mean a thing in the state where all showed drawing 1 and drawing 2, unless it refuses.

[0027]As shown in drawing 1 and drawing 2, the humidity controller (10) of this Embodiment 1 is provided with the casing (11) of a cube type. The adsorption-and-desorption unit (60) is stored by this casing (11).

[0028]The above-mentioned casing (11) is formed in flat rectangular parallelepiped shape with low height. The side in which the side in which it is located in a near side among the sides of a couple in which this casing (11) is located in the both ends of that longitudinal direction is constituted by the outdoor side panel (12), and is located in the back side is constituted by the interior-of-a-room side panel (15). An outdoor side suction opening (13) is formed in the rightist inclinations at an outdoor side panel (12), and the outdoor side outlet (14) is formed in the left. The interior-of-a-room side outlet (17) is formed in the rightist inclinations at the interior-of-a-room side panel (15), and the interior-of-a-room side suction opening (16) is formed in the left.

[0029]The outdoor side divider plate (20) and the interior-of-a-room side divider plate (25) are provided in the inside of the above-mentioned casing (11). The outdoor side divider plate (20) and the interior-of-a-room side divider plate (25) are formed in the same rectangular plate form as an outdoor side panel (12) and an outdoor side panel (12). The outdoor side divider plate (20) is installed in the position of outdoor side panel (12) slippage with the posture which faces an outdoor side panel (12). On the other hand, the interior-of-a-room side divider plate (25) is installed in the position of the interior-of-a-room side panel (15) slippage with the posture which faces the interior-of-a-room side panel (15).

[0030]The inside of the above-mentioned casing (11) is divided into three space by the outdoor side divider plate (20) and the interior-of-a-room side divider plate (25). Inside a casing (11), between an outdoor side panel (12) and outdoor side divider plates (20) turns into outdoor side space (40) concretely, Between an outdoor side divider plate (20) and the interior-of-a-room side divider plates (25) turns into center space (50), and between the interior-of-a-room side divider plate (25) and the interior-of-a-room side panels (15) is the interior-of-a-room side space (43).

[0031]The above-mentioned outdoor side space (40) is divided into right and left, a right-hand side portion constitutes an outdoor side right chamber room (41), and the left-hand side portion constitutes the outdoor side left chamber room (42). The outdoor side right chamber room (41) is open for free passage to outdoor space via an outdoor side suction opening (13). The outdoor side left chamber room (42) is open for free passage to outdoor space via an outdoor side outlet (14). Although not illustrated, the fan for air supply is installed in an outdoor side right chamber room (41), and the fan for exhaust air is installed in the outdoor side left chamber room (42).

[0032]The above-mentioned interior-of-a-room side space (43) is divided into right and left, a right-hand side portion constitutes the interior-of-a-room side right chamber room (44), and the left-hand side portion constitutes the interior-of-a-room side left chamber room (45). The interior-of-a-room side right chamber room (44) is open for free passage to interior space via the interior-of-a-room side outlet (17). The interior-of-a-room side left chamber room (45) is open for free passage to interior space via the interior-of-a-room side suction opening (16).

[0033]As shown also in drawing 3, the adsorption-and-desorption unit (60) is installed in the above-mentioned center space (50). The adsorption-and-desorption unit (60) is constituted by the Peltier device (61) which is a thermoelement, and two adsorbing members (62, 65). The Peltier device (61) is formed in tabular [of rectangular form / a little thick]. That length of one side of this Peltier device (61) is almost equal to the breadth of a casing (11), and other lengths of one side are a little shorter than center space (50) order length. The 1st adsorbing member (62) is attached to the upper surface at a Peltier device (61), and the 2nd adsorbing member (65) is attached to the undersurface. The details of an adsorption-and-desorption unit (60) are mentioned later.

[0034]One partition member (53) is provided at a time in the above-mentioned center space (50) before and behind the Peltier device (61) in an adsorption-and-desorption unit (60). Each partition member (53) is formed in the rectangular plate form whose length of a long side is almost equal to the breadth of a casing (11). And center space (50) is divided up and down by the Peltier device (61) of an adsorption-and-desorption unit (60), and the partition member (53) of two sheets.

[0035]An upper portion constitutes the 1st air duct (51), and the lower portion of the center space (50) divided up and down constitutes the 2nd air duct (52). The 1st adsorbing member (62) provided in the upper surface of the Peltier device (61) is located in the 1st air duct (51). On the other hand, the 2nd adsorbing member (65) provided in the undersurface of the Peltier device (61) is located in the 2nd air duct

(52).
[0036]Four openings are formed in the above-mentioned outdoor side divider plate (20) (refer to drawing 1 and drawing 2). Concretely, in the right half of the outdoor side divider plate (20), an outdoor side upper right opening (21) is formed in the upper part, and the outdoor side lower right opening (22) is formed in the lower part. The free passage of an outdoor side right chamber room (41) to the 1st air duct (51) can be attained by an outdoor side upper right opening (21), and it can be opened for free passage to the 2nd air duct (52) by an outdoor side lower right opening (22). On the other hand, in the left half of the outdoor side divider plate (20), an outdoor side upper left opening (23) is formed in the upper part, and the outdoor side lower left opening (24) is formed in the lower part. The free passage of an outdoor side left chamber room (42) to the 1st air duct (51) can be attained by an outdoor side upper left opening (23), and it can be opened for free passage to the 2nd air duct (52) by an outdoor side lower left opening (24).
[0037]The opening and closing shutter is provided in four openings (21-24) formed in the above-mentioned outdoor side divider plate (20) at each. Each of these openings (21-24) switch to an opening state and eyelid completely closure by opening and closing an opening and closing shutter. And the opening and closing shutter provided in the outdoor side upper right opening (21) and the outdoor side lower right opening (22) constitutes the change mechanism (30) for switching to the state of opening an outdoor side suction opening (13) for free passage to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52). The opening and closing shutter provided in the outdoor side upper left opening (23) and the outdoor side lower left opening (24) constitutes the change mechanism (30) for switching to the state of opening an outdoor side outlet (14) for free passage to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52).
[0038]Four openings are formed in the above-mentioned interior-of-a-room side divider plate (25) (refer to drawing 1 and drawing 2). Concretely, in the right half of the interior-of-a-room side divider plate (25), the interior-of-a-room side upper right opening (26) is formed in the upper part, and the interior-of-a-room side lower right opening (27) is formed in the lower part. The free passage of the interior-of-a-room side right chamber room (44) to the 1st air duct (51) can be attained by the interior-of-a-room side upper right opening (26), and it can be opened for free passage to the 2nd air duct (52) by the interior-of-a-room side lower right opening (27). On the other hand, in the left half of the interior-of-a-room side divider plate (25), the interior-of-a-room side upper left opening (28) is formed in the upper part, and the interior-of-a-room side lower left opening (29) is formed in the lower part. The free passage of the interior-of-a-room side left chamber room (45) to the 1st air duct (51) can be attained by the interior-of-a-room side upper left opening (28), and it can be opened for free passage to the 2nd air duct (52) by the interior-of-a-room side lower left opening (29).
[0039]The opening and closing shutter is provided in four openings (26-29) formed in the above-mentioned interior-of-a-room side divider plate (25) at each. Each of these openings (26-29) switch to an opening state and eyelid completely closure by opening and closing an opening and closing shutter. And the opening and closing shutter provided in the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower right opening (27) constitutes the change mechanism (30) for switching to the state of opening the interior-of-a-room side suction opening (16) for free passage to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52). The opening and closing shutter provided in the interior-of-a-room side upper left opening (28) and the interior-of-a-room side lower left opening (29) constitutes the change mechanism (30) for switching to the state of opening the interior-of-a-room side outlet (17) for free passage to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52).
[0040]The above-mentioned adsorption-and-desorption unit (60) is explained referring to drawing 4. As mentioned above, this adsorption-and-desorption unit (60) is provided with the following.
Peltier device (61).
Two adsorbing members (62, 65).

[0041]The above-mentioned Peltier device (61) is what combined the n type semiconductor and the p type semiconductor, and is formed in plate-like. If a direct current is sent through this Peltier device (61), movement of heat will arise to the sliding direction in drawing 4. If the direction of current which flows through a Peltier device (61) is reversed, top [in the figure], the state where heat moves toward the bottom, and the state where heat moves toward a top from under in the figure will switch from from.
[0042]Each adsorbing member (62, 65) is provided with a base (63, 66) and many fins (64, 67), and is formed in the shape of a heat sink. The base (63, 66) is formed in plate-like [a little thin]. On the other

hand, a fin (64, 67) is formed in long and slender square pole form, and is set up by the base. Adsorbent, such as zeolite, is applied to the surface of a base (63, 66) or a fin (64, 67).
[0043]And the undersurface of a base (63) is joined to the upper surface of a Peltier device (61), and the 1st adsorbing member (62) is in the state where a fin (64) is prolonged upward. On the other hand, the upper surface of a base (66) is joined to the undersurface of a Peltier device (61), and the 2nd adsorbing member (65) is in the state where a fin (67) is prolonged downward.
[0044]- Explain operation operation of the operation operation-above-mentioned humidity controller (10). This humidity controller (10) performs dehumidifying operation. The indoor air incorporated as humidified air is discharged to outdoor with the moisture desorbed from the adsorbent of the adsorbing member (62, 65) at the same time it dehumidifies the outdoor air which incorporated the humidity controller (10) as air to be dehumidified at the time of dehumidifying operation by an adsorbing member (62, 65) and supplies the interior of a room. A humidity controller (10) repeats the 1st operation and the 2nd operation by turns for every predetermined time at the time of dehumidifying operation.
[0045]The 1st operation of a humidity controller (10) is explained referring to drawing 1 and drawing 5 (a). In this 1st operation, by an outdoor side divider plate (20), an outdoor side upper right opening (21) and an outdoor side lower left opening (24) will be in an opening state, and an outdoor side lower right opening (22) and an outdoor side upper left opening (23) will be in eyelid completely closure. In the interior-of-a-room side divider plate (25), the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower left opening (29) will be in an opening state, and the interior-of-a-room side lower right opening (27) and the interior-of-a-room side upper left opening (28) will be in eyelid completely closure. And the 1st air duct (51) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 2nd air duct (52) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45).
[0046]On the other hand, in an adsorption-and-desorption unit (60), the energized Peltier device (61) moves heat toward the 2nd adsorbing member (65) from the 1st adsorbing member (62). That is, in an adsorption-and-desorption unit (60), the 1st adsorbing member (62) becomes the endothermic side of a Peltier device (61), and the 2nd adsorbing element becomes the heat dissipation side of a Peltier device (61).
[0047]The outdoor air which flowed into the outdoor side right chamber room (41) from the outdoor side suction opening (13) is sent into the 1st air duct (51) as air to be dehumidified. In the 1st air duct (51), the sent-in air to be dehumidified contacts the 1st adsorbing member (62), and the adsorbent of the 1st adsorbing member (62) is adsorbed in the moisture in the air to be dehumidified. On the other hand, the adsorbent applied to the surface is cooled in the 1st adsorbing member (62) that became the endothermic side of a Peltier device (61). And the heat of adsorption produced when the adsorbent of the 1st adsorbing member (62) was adsorbed in moisture is moved to the 2nd adsorbing member (65) by the Peltier device (61). Therefore, the rise in heat by the heat of adsorption which generated the air which flows through the 1st air duct (51) to be dehumidified is controlled. The air dehumidified by the 1st air duct (51) to be dehumidified flows into the interior-of-a-room side right chamber room (44), and is supplied to the interior of a room through the interior-of-a-room side outlet (17).
[0048]The indoor air which flowed into the interior-of-a-room side left chamber room (45) from the interior-of-a-room side suction opening (16) is sent into the 2nd air duct (52) as humidified air. In the 2nd air duct (52), the sent-in humidified air contacts the 2nd adsorbing member (65). On the other hand, in the 2nd adsorbing member (65), the adsorbent applied to the surface is heated and moisture is desorbed from the adsorbent. That is, the 2nd adsorbing member (65) is reproduced. The moisture desorbed from the adsorbent of the 2nd adsorbing member (65) is given to the humidified air which flows through the 2nd air duct (52). The humidified air humidified by the 2nd air duct (52) flows into an outdoor side left chamber room (42), and is discharged through an outdoor side outlet (14) outdoor.
[0049]The 2nd operation of a humidity controller (10) is explained referring to drawing 2 and drawing 5 (b). In this 2nd operation, by an outdoor side divider plate (20), an outdoor side lower right opening (22) and an outdoor side upper left opening (23) will be in an opening state, and an outdoor side upper right opening (21) and an outdoor side lower left opening (24) will be in eyelid completely closure. In the interior-of-a-room side divider plate (25), the interior-of-a-room side lower right opening (27) and the interior-of-a-room side upper left opening (28) will be in an opening state, and the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower left opening (29) will be in eyelid completely closure. And the 2nd air duct (52) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 1st air duct (51) is open for free

passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45).
[0050]On the other hand, in an adsorption-and-desorption unit (60), a direct current for reverse is sent by the Peltier device (61) with the time of the 1st operation. The energized Peltier device (61) moves heat toward the 1st adsorbing member (62) from the 2nd adsorbing member (65). That is, in an adsorption-and-desorption unit (60), the 2nd adsorbing member (65) becomes the endothermic side of a Peltier device (61), and the 1st adsorbing element becomes the heat dissipation side of a Peltier device (61).
[0051]The outdoor air which flowed into the outdoor side right chamber room (41) from the outdoor side suction opening (13) is sent into the 2nd air duct (52) as air to be dehumidified. In the 2nd air duct (52), the sent-in air to be dehumidified contacts the 2nd adsorbing member (65), and the adsorbent of the 2nd adsorbing member (65) is adsorbed in the moisture in the air to be dehumidified. On the other hand, the adsorbent applied to the surface is cooled in the 2nd adsorbing member (65) that became the endothermic side of a Peltier device (61). And the heat of adsorption produced when the adsorbent of the 2nd adsorbing member (65) was adsorbed in moisture is moved to the 1st adsorbing member (62) by the Peltier device (61). Therefore, the rise in heat by the heat of adsorption which generated the air which flows through the 2nd air duct (52) to be dehumidified is controlled. The air dehumidified by the 2nd air duct (52) to be dehumidified flows into the interior-of-a-room side right chamber room (44), and is supplied to the interior of a room through the interior-of-a-room side outlet (17).
[0052]The indoor air which flowed into the interior-of-a-room side left chamber room (45) from the interior-of-a-room side suction opening (16) is sent into the 1st air duct (51) as humidified air. In the 1st air duct (51), the sent-in humidified air contacts the 1st adsorbing member (62). On the other hand, in the 1st adsorbing member (62), the adsorbent applied to the surface is heated and moisture is desorbed from the adsorbent. That is, the 1st adsorbing member (62) is reproduced. The moisture desorbed from the adsorbent of the 1st adsorbing member (62) is given to the humidified air which flows through the 1st air duct (51). The humidified air humidified by the 1st air duct (51) flows into an outdoor side left chamber room (42), and is discharged through an outdoor side outlet (14) outdoor.
[0053]- According to the effect-book embodiment of Embodiment 1, adsorbent is formed on the surface of an adsorbing member (62, 65), and adsorbent is directly heated by the adsorbing member (62, 65) attached to the Peltier device (61). For this reason, it becomes possible to heat adsorbent certainly by small quantity of heat, and to desorb moisture from adsorbent compared with the conventional thing which heats adsorbent indirectly using the heated air. Therefore, according to this embodiment, the electric power which reproduction of an adsorbing member (62, 65) takes can be reduced, and the power consumption of a humidity controller (10) can be reduced by extension.
[0054]In this embodiment, adsorbent is cooled by the adsorbing member (62, 65) attached to the Peltier device (61). For this reason, the heat of adsorption generated when adsorbent is adsorbed in moisture is processed by an endothermic being carried out to an adsorbing member (62, 65). Therefore, according to this embodiment, the gas conditioning capability of a humidity controller (10) can fully be demonstrated by being able to prevent moisture from becoming adsorbent that it is hard to adsorb, and securing the moisture content which can stick to adsorbent with the generated heat of adsorption.
[0055]According to this embodiment, the whole humidity controller (10) can be formed in a thin shape. Therefore, according to this embodiment, the humidity controller (10) which can be installed also, for example in narrow space called space under the roof can be realized, and the restrictions at the time of installing a humidity controller (10) can be made small.
[0056]In the common humidity controller (10) which stores a disc-like adsorbing rotor to the casing (11) of rectangular parallelepiped shape, the dead space was made in the four corners of the casing (11) here, and the small size of the humidity controller (10) was difficult. On the other hand, in this embodiment, the adsorption-and-desorption unit (60) formed in general in quadrangular shape is stored to the casing (11) of rectangular parallelepiped shape. Therefore, according to this embodiment, the dead space in a casing (11) can be lost and the miniaturization of a humidity controller (10) can be attained.
[0057]According to this embodiment, heating and cooling of adsorbent in an adsorbing member (62, 65) can be performed only by energizing to a Peltier device (61). Therefore, according to this embodiment, the reliable humidity controller (10) which has few movable parts is realizable.
[0058]- Although only one adsorption-and-desorption unit (60) is provided in the casing (11), it replaces with this and may be made to provide two or more adsorption-and-desorption units (60) in the humidity controller (10) of the modification-above-mentioned embodiment of Embodiment 1. Here, what installed two adsorption-and-desorption units (60) in one casing (11) is explained, referring to drawing 6.
[0059]In the humidity controller (10) of this modification, an insulating member (54) is provided in the

center space (50) in a casing (11). This center space (50) is divided up and down by the insulating member (54). Every one adsorption-and-desorption unit (60) is installed in the center space (50) divided with the insulating member (54) up and down by the upper portion and the lower portion. Each is divided further up and down by the Peltier device (61) and a partition member (53), and the upper portion and the lower portion in this center space (50) are divided by the 1st upper air duct (51) and the 2nd lower air duct (52). That is, in the center space (50) of this modification, the 2nd air duct (52) and the 1st air duct (51) are formed by turns [two / every] toward the top from the bottom.
[0060]In the humidity controller (10) of this modification, although not illustrated, eight openings are formed in the outdoor side divider plate (20) and the interior-of-a-room side divider plate (25) at a time. And by opening and closing the opening and closing shutter provided in each opening, The state where the 1st air duct (51) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 2nd air duct (52) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45), The state where the 2nd air duct (52) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 1st air duct (51) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45) is switched.
[0061]Here, in order to heighten the capability of a humidity controller (10), it is effective to expand the surface area of an adsorbing member (62, 65). However, in order to expand the surface area of an adsorbing member (62, 65), when a fin (64, 67) is lengthened simply, cooling and heating adsorbent become insufficient [the tip part of the fin (64, 67) which is separated from a Peltier device (61)], and there is a possibility that adsorption capability cannot be improved so much as a result.
[0062]On the other hand, with the whole humidity controller (10), the surface area of an adsorbing member (62, 65) can be expanded, without extending the length of a fin (64, 67) in each adsorbing member (62, 65), if the number of the adsorption-and-desorption units (60) provided with an adsorbing member (62, 65) like this modification is increased. Therefore, according to this modification, the capability of a humidity controller (10) can be raised certainly.
[0063]
[Embodiment of the invention 2] Embodiment 2 of this invention changes the composition of an adsorption-and-desorption unit (60) in the humidity controller (10) of the above-mentioned Embodiment 1. Here, a different point from the above-mentioned Embodiment 1 is explained about the humidity controller (10) of this embodiment. in addition -- in explanation of this Embodiment 2 -- "-- upper" -- "-- lower", the "left", and the "right" -- "-- front" -- "-- especially back", "this side", and the "back" mean the thing in the state where all showed drawing 7, unless it refuses.
[0064]As shown in drawing 7, in the humidity controller (10) of this embodiment, an insulating member (54) is provided in the center space (50) in a casing (11). This center space (50) is divided up and down by the insulating member (54). An upper portion constitutes the 1st air duct (51), and the lower portion of the center space (50) divided with the insulating member (54) up and down constitutes the 2nd air duct (52).
[0065]The adsorption-and-desorption unit (60) is constituted in this humidity controller (10) by the refrigerant circuit (70) which circulates a refrigerant and performs a refrigerating cycle. As shown in drawing 9, this refrigerant circuit (70) is a compressor (71), an expansion valve (72) and two heat exchangers, and a closed circuit formed by carrying out piping connection of the four-way switching valve (73), and the inside is filled up with the refrigerant. That is, this refrigerant circuit (70) is constituted like the thing of the air conditioner in which an air conditioning is possible.
[0066]One of these is installed in the 1st air duct (51), and, as for two heat exchangers provided in the above-mentioned refrigerant circuit (70), another side is installed in the 2nd air duct (52). And the heat exchanger installed in the 1st air duct (51) constitutes the 1st adsorbing member (62), and the heat exchanger installed in the 2nd air duct (52) constitutes the 2nd adsorbing member (65).
[0067]each heat exchanger which constitutes an adsorbing member (62, 65) as shown in drawing 8 -- the any -- although -- it is the so-called fin and tube type heat exchanger of a cross fin type. And adsorbent, such as zeolite, is applied to the surface of the fin (76) in each heat exchanger. In each heat exchanger, a refrigerant circulates the inside of the heat exchanger tube (77) which penetrates a fin (76).
[0068]- The humidity controller (10) of an operation operation-book embodiment performs dehumidifying operation like the above-mentioned Embodiment 1 by repeating the 1st operation and the 2nd operation by turns for every predetermined time. Here, operation of the adsorption-and-desorption unit at the time of the 1st operation and the 2nd operation (60) is explained. The flow of the air in the humidity controller (10) of this embodiment to be dehumidified and humidified air is the same as the case of the above-mentioned

Embodiment 1.
[0069]First, as shown in drawing 9 (a), in the refrigerant circuit at the time of the 1st operation (70), a four-way switching valve (73) is switched to the state which shows in the figure, the 2nd adsorbing member (65) functions as a condenser, and the 1st adsorbing member (62) functions as an evaporator.
[0070]Concretely, the refrigerant breathed out from the compressor (71) is sent to the 2nd adsorbing member (65). In the 2nd adsorbing member (65), the sent-in refrigerant radiates heat and condenses and adsorbent is heated with this refrigerant. And moisture is desorbed from the heated adsorbent of the 2nd adsorbing member (65), and the moisture from which it was desorbed is given to the humidified air which flows through the 2nd air duct (52).
[0071]After the refrigerant condensed by the 2nd adsorbing member (65) is decompressed by an expansion valve (72), it is sent to the 1st adsorbing member (62). In the 1st adsorbing member (62), the sent-in refrigerant carries out an endothermic, and evaporates and adsorbent is cooled with this refrigerant. In this 1st adsorbing member (62), adsorbent is adsorbed in the moisture in the air which flows through the 1st air duct (51) to be dehumidified. And the endothermic of the heat of adsorption produced in that case is carried out to the refrigerant which flows through the 1st adsorbing member (62). The refrigerant which evaporated in the 1st adsorbing member (62) is inhaled and compressed to a compressor (71).
[0072]Next, as shown in drawing 9 (b), in the refrigerant circuit at the time of the 2nd operation (70), a four-way switching valve (73) is switched to the state which shows in the figure, the 1st adsorbing member (62) functions as a condenser, and the 2nd adsorbing member (65) functions as an evaporator.
[0073]Concretely, the refrigerant breathed out from the compressor (71) is sent to the 1st adsorbing member (62). In the 1st adsorbing member (62), the sent-in refrigerant radiates heat and condenses and adsorbent is heated with this refrigerant. And moisture is desorbed from the heated adsorbent of the 1st adsorbing member (62), and the moisture from which it was desorbed is given to the humidified air which flows through the 1st air duct (51).
[0074]After the refrigerant condensed by the 1st adsorbing member (62) is decompressed by an expansion valve (72), it is sent to the 2nd adsorbing member (65). In the 2nd adsorbing member (65), the sent-in refrigerant carries out an endothermic, and evaporates and adsorbent is cooled with this refrigerant. In this 2nd adsorbing member (65), adsorbent is adsorbed in the moisture in the air which flows through the 2nd air duct (52) to be dehumidified. And the endothermic of the heat of adsorption produced in that case is carried out to the refrigerant which flows through the 2nd adsorbing member (65). The refrigerant which evaporated in the 2nd adsorbing member (65) is inhaled and compressed to a compressor (71).
[0075]
[The embodiment of others of an invention] - It may be made to form a sensible-heat-exchange machine (80) in the interior-of-a-room side space (43) in a casing (11) in the humidity controller (10) of 1st modification-above-mentioned each embodiment, as shown in drawing 10. In this case, in the interior-of-a-room side panel (15) of a casing (11), the position of the interior-of-a-room side outlet (17) and an outdoor side outlet (14) interchanges.
[0076]The above-mentioned sensible-heat-exchange machine (80) is the so-called heat exchanger of a lamination type. Many passages of air to be dehumidified and passages of humidified air are formed in that thickness direction (it is perpendicularly to the space in drawing 10) by turns at this sensible-heat-exchange machine (80). And this sensible-heat-exchange machine (80) carries out heat exchange of the air to be dehumidified after being dehumidified in the adsorption-and-desorption unit (60), and the humidified air before being humidified in an adsorption-and-desorption unit (60).
[0077]Here, during indoor air conditioning, humidified air which is indoor air serves as low temperature comparatively. Then, the cold energy of the humidified air discharged outdoor is collected to the air supplied to the interior of a room to be dehumidified by carrying out heat exchange of air to be dehumidified and the humidified air with a sensible-heat-exchange machine (80).
[0078]- It is also possible to perform not only dehumidifying operation but humidifying operation in the humidity controller (10) of 2nd modification-above-mentioned each embodiment.
[0079]The indoor air incorporated as air to be dehumidified is dehumidified by an adsorbing member (62, 65), and it discharges to outdoor at the same time it supplies the outdoor air which incorporated the humidity controller (10) as humidified air at the time of humidifying operation to the interior of a room with the moisture desorbed from the adsorbent of the adsorbing member (62, 65). A humidity controller (10) repeats the 1st operation and the 2nd operation by turns for every predetermined time at the time of humidifying operation. Here, a different point from the time of dehumidifying operation is explained about the 1st operation and the 2nd operation at the time of humidifying operation.

[0080]In the 1st operation of humidifying operation, by an outdoor side divider plate (20), an outdoor side lower right opening (22) and an outdoor side upper left opening (23) will be in an opening state, and an outdoor side upper right opening (21) and an outdoor side lower left opening (24) will be in eyelid completely closure. In the interior-of-a-room side divider plate (25), the interior-of-a-room side lower right opening (27) and the interior-of-a-room side upper left opening (28) will be in an opening state, and the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower left opening (29) will be in eyelid completely closure. And the 2nd air duct (52) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 1st air duct (51) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45).
[0081]In an adsorption-and-desorption unit (60), like the time of dehumidifying operation, the 1st adsorbing member (62) becomes the endothermic side of a Peltier device (61), and the 2nd adsorbing element becomes the heat dissipation side of a Peltier device (61).
[0082]The outdoor air which flowed into the outdoor side right chamber room (41) from the outdoor side suction opening (13) is sent into the 2nd air duct (52) as humidified air. In the 2nd air duct (52), the sent-in humidified air contacts the 2nd adsorbing member (65). On the other hand, in the 2nd adsorbing member (65), the adsorbent applied to the surface is heated and moisture is desorbed from the adsorbent. The moisture desorbed from the adsorbent of the 2nd adsorbing member (65) is given to the humidified air which flows through the 2nd air duct (52). The humidified air humidified by the 2nd air duct (52) flows into the interior-of-a-room side right chamber room (44), and is supplied to the interior of a room through the interior-of-a-room side outlet (17).
[0083]The indoor air which flowed into the interior-of-a-room side left chamber room (45) from the interior-of-a-room side suction opening (16) is sent into the 1st air duct (51) as air to be dehumidified. In the 1st air duct (51), the sent-in air to be dehumidified contacts the 1st adsorbing member (62), and the adsorbent of the 1st adsorbing member (62) is adsorbed in the moisture in the air to be dehumidified. On the other hand, the adsorbent applied to the surface is cooled in the 1st adsorbing member (62) that became the endothermic side of a Peltier device (61). And the heat of adsorption produced when the adsorbent of the 1st adsorbing member (62) was adsorbed in moisture is moved to the 2nd adsorbing member (65) by the Peltier device (61). The air dehumidified by the 1st air duct (51) to be dehumidified flows into an outdoor side left chamber room (42), and is discharged through an outdoor side outlet (14) outdoor.
[0084]In the 2nd operation of humidifying operation, by an outdoor side divider plate (20), an outdoor side upper right opening (21) and an outdoor side lower left opening (24) will be in an opening state, and an outdoor side lower right opening (22) and an outdoor side upper left opening (23) will be in eyelid completely closure. In the interior-of-a-room side divider plate (25), the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower left opening (29) will be in an opening state, and the interior-of-a-room side lower right opening (27) and the interior-of-a-room side upper left opening (28) will be in eyelid completely closure. And the 1st air duct (51) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 2nd air duct (52) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45).
[0085]In an adsorption-and-desorption unit (60), like the time of dehumidifying operation, the 2nd adsorbing member (65) becomes the endothermic side of a Peltier device (61), and the 1st adsorbing element becomes the heat dissipation side of a Peltier device (61).
[0086]The outdoor air which flowed into the outdoor side right chamber room (41) from the outdoor side suction opening (13) is sent into the 1st air duct (51) as humidified air. In the 1st air duct (51), the sent-in humidified air contacts the 1st adsorbing member (62). On the other hand, in the 1st adsorbing member (62), the adsorbent applied to the surface is heated and moisture is desorbed from the adsorbent. The moisture desorbed from the adsorbent of the 1st adsorbing member (62) is given to the humidified air which flows through the 1st air duct (51). The humidified air humidified by the 1st air duct (51) flows into the interior-of-a-room side right chamber room (44), and is supplied to the interior of a room through the interior-of-a-room side outlet (17).
[0087]The indoor air which flowed into the interior-of-a-room side left chamber room (45) from the interior-of-a-room side suction opening (16) is sent into the 2nd air duct (52) as air to be dehumidified. In the 2nd air duct (52), the sent-in air to be dehumidified contacts the 2nd adsorbing member (65), and the adsorbent of the 2nd adsorbing member (65) is adsorbed in the moisture in the air to be dehumidified. On the other hand, the adsorbent applied to the surface is cooled in the 2nd adsorbing member (65) that became

the endothermic side of a Peltier device (61). And the heat of adsorption produced when the adsorbent of the 2nd adsorbing member (65) was adsorbed in moisture is moved to the 1st adsorbing member (62) by the Peltier device (61). The air dehumidified by the 2nd air duct (52) to be dehumidified flows into an outdoor side left chamber room (42), and is discharged through an outdoor side outlet (14) outdoor.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the humidity controller which performs humidity control of air.

[0002]

[Description of the Prior Art]Conventionally, the humidity controller which dehumidifies air using adsorbent is known as indicated by JP,62-68520,A. The adsorbing element which it is formed in the shape of a rotor, and is rotated is provided in this humidity controller. Many passages of the air (air to be dehumidified) dehumidified are formed in this adsorbing element. And air to be dehumidified contacts adsorbent, while passing through the passage of an adsorbing element, and it is adsorbed by adsorbent in the moisture contained in air to be dehumidified. When adsorbent is adsorbed in moisture, heat of adsorption occurs. So, in the above-mentioned humidity controller, the air duct for cooling is also formed in an adsorbing element, and the generated heat of adsorption is processed.

[0003]Reproduction of an adsorbing element is performed in the above-mentioned humidity controller. Specifically, the air for reproduction heated with warmers, such as an electric heater, is supplied to the adsorbing element. The adsorbent of an adsorbing element is heated by contacting the hot air for reproduction. And it is desorbed from moisture from the heated adsorbent, and an adsorbing element is reproduced.

[0004]

[Problem(s) to be Solved by the Invention]However, in the above-mentioned humidity controller, when reproducing an adsorbing element, the air for reproduction heated with the electric heater etc. is supplied to an adsorbing element, and the adsorbing element is indirectly heated with the heated air for reproduction. For this reason, there is a problem that energies, such as electric power which reproduction of an adsorbing element takes compared with the case where adsorbent is heated directly, with an electric heater etc., increase.

[0005]To this problem, adsorbent is formed, for example in the surfaces, such as an electric heater, and the measure of heating adsorbent directly and desorbing moisture from adsorbent can be considered. when such a measure is taken, it becomes impossible however, to process the heat of adsorption generated when adsorbent is alike and moisture adsorbs For this reason, the moisture content which can be made to stick to adsorbent decreases, and the problem that the gas conditioning capability of a humidity controller declines arises.

[0006]this invention is made in view of this point, and comes out. The purpose is in reducing the energies which operation of a humidity controller takes, avoiding that the gas conditioning capability of ** declines.

[0007]

[Means for Solving the Problem]An invention of claim 1 is aimed at a humidity controller which supplies air to be dehumidified or humidified humidified air which incorporated air to be dehumidified and humidified air and was dehumidified to the interior of a room. And it has two or more adsorbing members (62, 65) for performing cooling and heating of adsorbent which were formed in the surface, The 1st operation contacted to humidified air heating adsorbent in the 2nd adsorbing member (65) at the same time it makes air to be dehumidified contact, cooling adsorbent in the 1st adsorbing member (62), By the 2nd adsorbing member (65), by the 1st adsorbing member (62), heating adsorbent, the 2nd operation contacted to humidified air is repeated by turns, and is performed at the same time it makes air to be dehumidified contact, cooling adsorbent.

[0008]While an air breathing mouth (13, 16) and every one outlet (14, 17) equip each of the side of a couple which is formed in flat rectangular parallelepiped shape and counters in the humidity controller according to claim 1 with a casing (11) which carries out an opening, an invention of claim 2 inside the above-mentioned casing (11), Are divided so that the 1st air duct (51) in which the 1st adsorbing member

(62) was installed, and the 2nd air duct (52) in which the 2nd adsorbing member (65) was installed may adjoin mutually in a thickness direction of this casing (11), and. A change mechanism (30) for switching to the state of opening for free passage each of a suction opening (13, 16) which carries out an opening to these every two casings (11), and an outlet (14, 17) to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52) is stored.
[0009]An invention of claim 3 is provided with a thermoelement (61) to which both the 1st adsorbing member (62) and the 2nd adsorbing member (65) were attached in the humidity controller according to claim 1 or 2, the above-mentioned thermoelement (61) -- the 1st -- carrying out an endothermic from the 1st adsorbing member (62) working, and radiating heat to the 2nd adsorbing member (65) -- the 2nd -- an endothermic is carried out from the 2nd adsorbing member (65) working, and heat is radiated to the 1st adsorbing member (62).
[0010]An invention of claim 4 is provided with a refrigerant circuit (70) which circulates a refrigerant with which it filled up in the humidity controller according to claim 1 or 2, and performs a refrigerating cycle, At least one of two or more heat exchangers provided in the above-mentioned refrigerant circuit (70) constitutes the 1st adsorbing member (62), and the remainder constitutes the 2nd adsorbing member (65), In the above-mentioned refrigerant circuit (70) under 1st operation, a heat exchanger which constitutes the 1st adsorbing member (62) turns into an evaporator, and a heat exchanger which constitutes the 2nd adsorbing member (65) turns into a condenser, In the above-mentioned refrigerant circuit (70) under 2nd operation, a heat exchanger which constitutes the 1st adsorbing member (62) turns into a condenser, and a heat exchanger which constitutes the 2nd adsorbing member (65) turns into an evaporator.
[0011]At the same time an invention of claim 5 dehumidifies outdoor air incorporated as air to be dehumidified by an adsorbing member (62, 65) in the humidity controller according to claim 1 or 2 and supplies it to the interior of a room, Operation which discharges to outdoor indoor air incorporated as humidified air with moisture desorbed from adsorbent of an adsorbing member (62, 65) is constituted possible.
[0012]At the same time an invention of claim 6 supplies outdoor air incorporated as humidified air to the interior of a room in the humidity controller according to claim 1 or 2 with moisture desorbed from adsorbent of an adsorbing member (62, 65), Operation which dehumidifies indoor air incorporated as air to be dehumidified by an adsorbing member (62, 65), and is discharged to outdoor is constituted possible.
[0013]An invention of claim 7 is provided with a sensible-heat-exchange machine (80) for carrying out heat exchange of the humidified air before contacting air to be dehumidified after contacting an adsorbing member, and adsorbent in the humidity controller according to claim 5 or 6.
[0014]- In an invention of operation-claim 1, two or more adsorbing members (62, 65) are provided in a humidity controller (10). Adsorbent is formed in the surface of each adsorbing member. In each adsorbing member (62, 65), cooling and heating of adsorbent which were formed in the surface are performed.
[0015]In a humidity controller (10) of this invention, the 1st operation and the 2nd operation are performed repeatedly by turns. In the 1st operation, adsorbent of the 1st adsorbing member (62) is adsorbed in moisture in the air to be dehumidified. As for heat of adsorption generated in that case, the 1st adsorbing member (62) carries out the endothermic of this. In this 1st operation, adsorbent is heated by the 2nd adsorbing member (65), and moisture desorbed from this adsorbent is given to humidified air. On the other hand, in the 2nd operation, adsorbent of the 2nd adsorbing member (65) is adsorbed in moisture in the air to be dehumidified. As for heat of adsorption generated in that case, the 2nd adsorbing member (65) carries out the endothermic of this. In this 2nd operation, adsorbent is heated by the 1st adsorbing member (62), and moisture desorbed from this adsorbent is given to humidified air.
[0016]And a humidity controller (10) of this invention performs the 1st operation and the 2nd operation by turns, and supplies dehumidified air to be dehumidified or humidified humidified air to the interior of a room. Only operation which supplies dehumidified air to be dehumidified to the interior of a room may be possible for this humidity controller (10), and only operation which supplies humidified humidified air to the interior of a room may be possible for it. This humidity controller (10) may switch operation which supplies dehumidified air to be dehumidified to the interior of a room, and operation which supplies humidified humidified air to the interior of a room, and may be performed.
[0017]In an invention of claim 2, an adsorbing member (62, 65) and a change mechanism (30) are stored by casing (11) of flat rectangular parallelepiped shape. In this casing (11), an air breathing mouth (13) and every one outlet (14) carry out an opening to one side among the sides of a couple which counters mutually, and an air breathing mouth (16) and every one outlet (17) are carrying out the opening also to the side of another side. That is, an air breathing mouth (13, 16) and every two outlets (14, 17) are provided in

this casing (11).
[0018]As for a casing (11) provided in a humidity controller (10) of this invention, section forming of the 1st air duct (51) and the 2nd air duct (52) is carried out to the inside. The 1st air duct (51) and the 2nd air duct (52) adjoin each other mutually in a thickness direction of a flat casing (11). And the 1st adsorbing member (62) is provided in the 1st air duct (51), and the 2nd adsorbing member (65) is provided in the 2nd air duct (52).
[0019]When a humidity controller (10) of this invention operates a change mechanism (30), The state where one side of a suction opening (13, 16) provided in two casings (11) is open for free passage to the 1st air duct (51), and another side is open for free passage to the 2nd air duct (52), and the state where one of these is open for free passage to the 2nd air duct (52), and another side is open for free passage to the 1st air duct (51) are switched. When this humidity controller (10) operates a change mechanism (30), The state where one side of an outlet (14, 17) provided in two casings (11) is open for free passage to the 1st air duct (51), and another side is open for free passage to the 2nd air duct (52), and the state where one of these is open for free passage to the 2nd air duct (52), and another side is open for free passage to the 1st air duct (51) are switched.
[0020]In an invention of claim 3, a thermoelement (61) is provided in a humidity controller (10). Both the 1st adsorbing member (62) and the 2nd adsorbing member (65) are attached to this thermoelement (61). During operation of a humidity controller (10), it energizes to this thermoelement (61). and the 1st -- if working, a thermoelement (61) will carry out an endothermic from the 1st adsorbing member (62), and will radiate heat to the 2nd adsorbing member (65) -- the 2nd -- if working, a thermoelement (61) will carry out an endothermic from the 2nd adsorbing member (65), and will radiate heat to the 1st adsorbing member (62).
[0021]In an invention of claim 4, a refrigerant circuit (70) is established in a humidity controller (10). At least one of them becomes the 1st adsorbing member (62), and, as for two or more heat exchangers provided in a refrigerant circuit (70), the remainder serves as the 2nd adsorbing member (65). And during the 1st operation, a refrigerant radiates heat and condenses by a heat exchanger which constitutes the 2nd adsorbing member (65), and in a heat exchanger which constitutes the 1st adsorbing member (62), a refrigerant carries out an endothermic and evaporates. On the other hand, during the 2nd operation, a refrigerant radiates heat and condenses by a heat exchanger which constitutes the 1st adsorbing member (62), and in a heat exchanger which constitutes the 2nd adsorbing member (65), a refrigerant carries out an endothermic and evaporates.
[0022]In an invention of claim 5, operation which discharges to outdoor indoor air incorporated as humidified air is performed at the same time it supplies the interior of a room after dehumidifying outdoor air incorporated as air to be dehumidified. That is, when performing indoor ventilation, operation which dehumidifies air supply for ventilation is performed.
[0023]In an invention of claim 6, operation which discharges to outdoor indoor air incorporated as air to be dehumidified is performed at the same time it supplies the interior of a room after humidifying outdoor air incorporated as humidified air. That is, when performing indoor ventilation, operation which humidifies air supply for ventilation is performed.
[0024]In an invention of claim 7, a sensible-heat-exchange machine (80) is formed in a humidity controller (10). In this sensible-heat-exchange machine (80), air to be dehumidified before being dehumidified, and humidified air after being humidified perform heat exchange.
[0025]
[Embodiment of the invention 1] Hereafter, an embodiment of this invention is described in detail based on a drawing.
[0026]First, Embodiment 1 of this invention is described, referring to drawing 1 - drawing 4 suitably. in addition -- in explanation of this Embodiment 1 -- "-- upper" -- "-- lower", the "left", and the "right" -- "-- front" -- "-- especially back", "this side", and the "back" mean a thing in the state where all showed drawing 1 and drawing 2, unless it refuses.
[0027]As shown in drawing 1 and drawing 2, the humidity controller (10) of this Embodiment 1 is provided with the casing (11) of a cube type. The adsorption-and-desorption unit (60) is stored by this casing (11).
[0028]The above-mentioned casing (11) is formed in flat rectangular parallelepiped shape with low height. The side in which the side in which it is located in a near side among the sides of a couple in which this casing (11) is located in the both ends of that longitudinal direction is constituted by the outdoor side panel (12), and is located in the back side is constituted by the interior-of-a-room side panel (15). An outdoor side

suction opening (13) is formed in the rightist inclinations at an outdoor side panel (12), and the outdoor side outlet (14) is formed in the left. The interior-of-a-room side outlet (17) is formed in the rightist inclinations at the interior-of-a-room side panel (15), and the interior-of-a-room side suction opening (16) is formed in the left.

[0029]The outdoor side divider plate (20) and the interior-of-a-room side divider plate (25) are provided in the inside of the above-mentioned casing (11). The outdoor side divider plate (20) and the interior-of-a-room side divider plate (25) are formed in the same rectangular plate form as an outdoor side panel (12) and an outdoor side panel (12). The outdoor side divider plate (20) is installed in the position of outdoor side panel (12) slippage with the posture which faces an outdoor side panel (12). On the other hand, the interior-of-a-room side divider plate (25) is installed in the position of the interior-of-a-room side panel (15) slippage with the posture which faces the interior-of-a-room side panel (15).

[0030]The inside of the above-mentioned casing (11) is divided into three space by the outdoor side divider plate (20) and the interior-of-a-room side divider plate (25). Inside a casing (11), between an outdoor side panel (12) and outdoor side divider plates (20) turns into outdoor side space (40) concretely, Between an outdoor side divider plate (20) and the interior-of-a-room side divider plates (25) turns into center space (50), and between the interior-of-a-room side divider plate (25) and the interior-of-a-room side panels (15) is the interior-of-a-room side space (43).

[0031]The above-mentioned outdoor side space (40) is divided into right and left, a right-hand side portion constitutes an outdoor side right chamber room (41), and the left-hand side portion constitutes the outdoor side left chamber room (42). The outdoor side right chamber room (41) is open for free passage to outdoor space via an outdoor side suction opening (13). The outdoor side left chamber room (42) is open for free passage to outdoor space via an outdoor side outlet (14). Although not illustrated, the fan for air supply is installed in an outdoor side right chamber room (41), and the fan for exhaust air is installed in the outdoor side left chamber room (42).

[0032]The above-mentioned interior-of-a-room side space (43) is divided into right and left, a right-hand side portion constitutes the interior-of-a-room side right chamber room (44), and the left-hand side portion constitutes the interior-of-a-room side left chamber room (45). The interior-of-a-room side right chamber room (44) is open for free passage to interior space via the interior-of-a-room side outlet (17). The interior-of-a-room side left chamber room (45) is open for free passage to interior space via the interior-of-a-room side suction opening (16).

[0033]As shown also in drawing 3, the adsorption-and-desorption unit (60) is installed in the above-mentioned center space (50). The adsorption-and-desorption unit (60) is constituted by the Peltier device (61) which is a thermoelement, and two adsorbing members (62, 65). The Peltier device (61) is formed in tabular [of rectangular form / a little thick]. That length of one side of this Peltier device (61) is almost equal to the breadth of a casing (11), and other lengths of one side are a little shorter than center space (50) order length. The 1st adsorbing member (62) is attached to the upper surface at a Peltier device (61), and the 2nd adsorbing member (65) is attached to the undersurface. The details of an adsorption-and-desorption unit (60) are mentioned later.

[0034]One partition member (53) is provided at a time in the above-mentioned center space (50) before and behind the Peltier device (61) in an adsorption-and-desorption unit (60). Each partition member (53) is formed in the rectangular plate form whose length of a long side is almost equal to the breadth of a casing (11). And center space (50) is divided up and down by the Peltier device (61) of an adsorption-and-desorption unit (60), and the partition member (53) of two sheets.

[0035]An upper portion constitutes the 1st air duct (51), and the lower portion of the center space (50) divided up and down constitutes the 2nd air duct (52). The 1st adsorbing member (62) provided in the upper surface of the Peltier device (61) is located in the 1st air duct (51). On the other hand, the 2nd adsorbing member (65) provided in the undersurface of the Peltier device (61) is located in the 2nd air duct (52).

[0036]Four openings are formed in the above-mentioned outdoor side divider plate (20) (refer to drawing 1 and drawing 2). Concretely, in the right half of the outdoor side divider plate (20), an outdoor side upper right opening (21) is formed in the upper part, and the outdoor side lower right opening (22) is formed in the lower part. The free passage of an outdoor side right chamber room (41) to the 1st air duct (51) can be attained by an outdoor side upper right opening (21), and it can be opened for free passage to the 2nd air duct (52) by an outdoor side lower right opening (22). On the other hand, in the left half of the outdoor side divider plate (20), an outdoor side upper left opening (23) is formed in the upper part, and the outdoor side lower left opening (24) is formed in the lower part. The free passage of an outdoor side left chamber room

(42) to the 1st air duct (51) can be attained by an outdoor side upper left opening (23), and it can be opened for free passage to the 2nd air duct (52) by an outdoor side lower left opening (24).
[0037]The opening and closing shutter is provided in four openings (21-24) formed in the above-mentioned outdoor side divider plate (20) at each. Each of these openings (21-24) switch to an opening state and eyelid completely closure by opening and closing an opening and closing shutter. And the opening and closing shutter provided in the outdoor side upper right opening (21) and the outdoor side lower right opening (22) constitutes the change mechanism (30) for switching to the state of opening an outdoor side suction opening (13) for free passage to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52). The opening and closing shutter provided in the outdoor side upper left opening (23) and the outdoor side lower left opening (24) constitutes the change mechanism (30) for switching to the state of opening an outdoor side outlet (14) for free passage to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52).
[0038]Four openings are formed in the above-mentioned interior-of-a-room side divider plate (25) (refer to drawing 1 and drawing 2). Concretely, in the right half of the interior-of-a-room side divider plate (25), the interior-of-a-room side upper right opening (26) is formed in the upper part, and the interior-of-a-room side lower right opening (27) is formed in the lower part. The free passage of the interior-of-a-room side right chamber room (44) to the 1st air duct (51) can be attained by the interior-of-a-room side upper right opening (26), and it can be opened for free passage to the 2nd air duct (52) by the interior-of-a-room side lower right opening (27). On the other hand, in the left half of the interior-of-a-room side divider plate (25), the interior-of-a-room side upper left opening (28) is formed in the upper part, and the interior-of-a-room side lower left opening (29) is formed in the lower part. The free passage of the interior-of-a-room side left chamber room (45) to the 1st air duct (51) can be attained by the interior-of-a-room side upper left opening (28), and it can be opened for free passage to the 2nd air duct (52) by the interior-of-a-room side lower left opening (29).
[0039]The opening and closing shutter is provided in four openings (26-29) formed in the above-mentioned interior-of-a-room side divider plate (25) at each. Each of these openings (26-29) switch to an opening state and eyelid completely closure by opening and closing an opening and closing shutter. And the opening and closing shutter provided in the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower right opening (27) constitutes the change mechanism (30) for switching to the state of opening the interior-of-a-room side suction opening (16) for free passage to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52). The opening and closing shutter provided in the interior-of-a-room side upper left opening (28) and the interior-of-a-room side lower left opening (29) constitutes the change mechanism (30) for switching to the state of opening the interior-of-a-room side outlet (17) for free passage to the state where it is open for free passage to the 1st air duct (51), and the 2nd air duct (52).
[0040]The above-mentioned adsorption-and-desorption unit (60) is explained referring to drawing 4. As mentioned above, this adsorption-and-desorption unit (60) is provided with the following.
Peltier device (61).
Two adsorbing members (62, 65).

[0041]The above-mentioned Peltier device (61) is what combined the n type semiconductor and the p type semiconductor, and is formed in plate-like. If a direct current is sent through this Peltier device (61), movement of heat will arise to the sliding direction in drawing 4. If the direction of current which flows through a Peltier device (61) is reversed, top [in the figure], the state where heat moves toward the bottom, and the state where heat moves toward a top from under in the figure will switch from from.
[0042]Each adsorbing member (62, 65) is provided with a base (63, 66) and many fins (64, 67), and is formed in the shape of a heat sink. The base (63, 66) is formed in plate-like [a little thin]. On the other hand, a fin (64, 67) is formed in long and slender square pole form, and is set up by the base. Adsorbent, such as zeolite, is applied to the surface of a base (63, 66) or a fin (64, 67).
[0043]And the undersurface of a base (63) is joined to the upper surface of a Peltier device (61), and the 1st adsorbing member (62) is in the state where a fin (64) is prolonged upward. On the other hand, the upper surface of a base (66) is joined to the undersurface of a Peltier device (61), and the 2nd adsorbing member (65) is in the state where a fin (67) is prolonged downward.
[0044]- Explain operation operation of the operation operation-above-mentioned humidity controller (10). This humidity controller (10) performs dehumidifying operation. The indoor air incorporated as humidified air is discharged to outdoor with the moisture desorbed from the adsorbent of the adsorbing member (62,

65) at the same time it dehumidifies the outdoor air which incorporated the humidity controller (10) as air to be dehumidified at the time of dehumidifying operation by an adsorbing member (62, 65) and supplies the interior of a room. A humidity controller (10) repeats the 1st operation and the 2nd operation by turns for every predetermined time at the time of dehumidifying operation.

[0045]The 1st operation of a humidity controller (10) is explained referring to drawing 1 and drawing 5 (a). In this 1st operation, by an outdoor side divider plate (20), an outdoor side upper right opening (21) and an outdoor side lower left opening (24) will be in an opening state, and an outdoor side lower right opening (22) and an outdoor side upper left opening (23) will be in eyelid completely closure. In the interior-of-a-room side divider plate (25), the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower left opening (29) will be in an opening state, and the interior-of-a-room side lower right opening (27) and the interior-of-a-room side upper left opening (28) will be in eyelid completely closure. And the 1st air duct (51) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 2nd air duct (52) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45).

[0046]On the other hand, in an adsorption-and-desorption unit (60), the energized Peltier device (61) moves heat toward the 2nd adsorbing member (65) from the 1st adsorbing member (62). That is, in an adsorption-and-desorption unit (60), the 1st adsorbing member (62) becomes the endothermic side of a Peltier device (61), and the 2nd adsorbing element becomes the heat dissipation side of a Peltier device (61).

[0047]The outdoor air which flowed into the outdoor side right chamber room (41) from the outdoor side suction opening (13) is sent into the 1st air duct (51) as air to be dehumidified. In the 1st air duct (51), the sent-in air to be dehumidified contacts the 1st adsorbing member (62), and the adsorbent of the 1st adsorbing member (62) is adsorbed in the moisture in the air to be dehumidified. On the other hand, the adsorbent applied to the surface is cooled in the 1st adsorbing member (62) that became the endothermic side of a Peltier device (61). And the heat of adsorption produced when the adsorbent of the 1st adsorbing member (62) was adsorbed in moisture is moved to the 2nd adsorbing member (65) by the Peltier device (61). Therefore, the rise in heat by the heat of adsorption which generated the air which flows through the 1st air duct (51) to be dehumidified is controlled. The air dehumidified by the 1st air duct (51) to be dehumidified flows into the interior-of-a-room side right chamber room (44), and is supplied to the interior of a room through the interior-of-a-room side outlet (17).

[0048]The indoor air which flowed into the interior-of-a-room side left chamber room (45) from the interior-of-a-room side suction opening (16) is sent into the 2nd air duct (52) as humidified air. In the 2nd air duct (52), the sent-in humidified air contacts the 2nd adsorbing member (65). On the other hand, in the 2nd adsorbing member (65), the adsorbent applied to the surface is heated and moisture is desorbed from the adsorbent. That is, the 2nd adsorbing member (65) is reproduced. The moisture desorbed from the adsorbent of the 2nd adsorbing member (65) is given to the humidified air which flows through the 2nd air duct (52). The humidified air humidified by the 2nd air duct (52) flows into an outdoor side left chamber room (42), and is discharged through an outdoor side outlet (14) outdoor.

[0049]The 2nd operation of a humidity controller (10) is explained referring to drawing 2 and drawing 5 (b). In this 2nd operation, by an outdoor side divider plate (20), an outdoor side lower right opening (22) and an outdoor side upper left opening (23) will be in an opening state, and an outdoor side upper right opening (21) and an outdoor side lower left opening (24) will be in eyelid completely closure. In the interior-of-a-room side divider plate (25), the interior-of-a-room side lower right opening (27) and the interior-of-a-room side upper left opening (28) will be in an opening state, and the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower left opening (29) will be in eyelid completely closure. And the 2nd air duct (52) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 1st air duct (51) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45).

[0050]On the other hand, in an adsorption-and-desorption unit (60), a direct current for reverse is sent by the Peltier device (61) with the time of the 1st operation. The energized Peltier device (61) moves heat toward the 1st adsorbing member (62) from the 2nd adsorbing member (65). That is, in an adsorption-and-desorption unit (60), the 2nd adsorbing member (65) becomes the endothermic side of a Peltier device (61), and the 1st adsorbing element becomes the heat dissipation side of a Peltier device (61).

[0051]The outdoor air which flowed into the outdoor side right chamber room (41) from the outdoor side suction opening (13) is sent into the 2nd air duct (52) as air to be dehumidified. In the 2nd air duct (52), the sent-in air to be dehumidified contacts the 2nd adsorbing member (65), and the adsorbent of the 2nd

adsorbing member (65) is adsorbed in the moisture in the air to be dehumidified. On the other hand, the adsorbent applied to the surface is cooled in the 2nd adsorbing member (65) that became the endothermic side of a Peltier device (61). And the heat of adsorption produced when the adsorbent of the 2nd adsorbing member (65) was adsorbed in moisture is moved to the 1st adsorbing member (62) by the Peltier device (61). Therefore, the rise in heat by the heat of adsorption which generated the air which flows through the 2nd air duct (52) to be dehumidified is controlled. The air dehumidified by the 2nd air duct (52) to be dehumidified flows into the interior-of-a-room side right chamber room (44), and is supplied to the interior of a room through the interior-of-a-room side outlet (17).

[0052]The indoor air which flowed into the interior-of-a-room side left chamber room (45) from the interior-of-a-room side suction opening (16) is sent into the 1st air duct (51) as humidified air. In the 1st air duct (51), the sent-in humidified air contacts the 1st adsorbing member (62). On the other hand, in the 1st adsorbing member (62), the adsorbent applied to the surface is heated and moisture is desorbed from the adsorbent. That is, the 1st adsorbing member (62) is reproduced. The moisture desorbed from the adsorbent of the 1st adsorbing member (62) is given to the humidified air which flows through the 1st air duct (51). The humidified air humidified by the 1st air duct (51) flows into an outdoor side left chamber room (42), and is discharged through an outdoor side outlet (14) outdoor.

[0053]- According to the effect-book embodiment of Embodiment 1, adsorbent is formed on the surface of an adsorbing member (62, 65), and adsorbent is directly heated by the adsorbing member (62, 65) attached to the Peltier device (61). For this reason, it becomes possible to heat adsorbent certainly by small quantity of heat, and to desorb moisture from adsorbent compared with the conventional thing which heats adsorbent indirectly using the heated air. Therefore, according to this embodiment, the electric power which reproduction of an adsorbing member (62, 65) takes can be reduced, and the power consumption of a humidity controller (10) can be reduced by extension.

[0054]In this embodiment, adsorbent is cooled by the adsorbing member (62, 65) attached to the Peltier device (61). For this reason, the heat of adsorption generated when adsorbent is adsorbed in moisture is processed by an endothermic being carried out to an adsorbing member (62, 65). Therefore, according to this embodiment, the gas conditioning capability of a humidity controller (10) can fully be demonstrated by being able to prevent moisture from becoming adsorbent that it is hard to adsorb, and securing the moisture content which can stick to adsorbent with the generated heat of adsorption.

[0055]According to this embodiment, the whole humidity controller (10) can be formed in a thin shape. Therefore, according to this embodiment, the humidity controller (10) which can be installed also, for example in narrow space called space under the roof can be realized, and the restrictions at the time of installing a humidity controller (10) can be made small.

[0056]In the common humidity controller (10) which stores a disc-like adsorbing rotor to the casing (11) of rectangular parallelepiped shape, the dead space was made in the four corners of the casing (11) here, and the small size of the humidity controller (10) was difficult. On the other hand, in this embodiment, the adsorption-and-desorption unit (60) formed in general in quadrangular shape is stored to the casing (11) of rectangular parallelepiped shape. Therefore, according to this embodiment, the dead space in a casing (11) can be lost and the miniaturization of a humidity controller (10) can be attained.

[0057]According to this embodiment, heating and cooling of adsorbent in an adsorbing member (62, 65) can be performed only by energizing to a Peltier device (61). Therefore, according to this embodiment, the reliable humidity controller (10) which has few movable parts is realizable.

[0058]- Although only one adsorption-and-desorption unit (60) is provided in the casing (11), it replaces with this and may be made to provide two or more adsorption-and-desorption units (60) in the humidity controller (10) of the modification-above-mentioned embodiment of Embodiment 1. Here, what installed two adsorption-and-desorption units (60) in one casing (11) is explained, referring to drawing 6.

[0059]In the humidity controller (10) of this modification, an insulating member (54) is provided in the center space (50) in a casing (11). This center space (50) is divided up and down by the insulating member (54). Every one adsorption-and-desorption unit (60) is installed in the center space (50) divided with the insulating member (54) up and down by the upper portion and the lower portion. Each is divided further up and down by the Peltier device (61) and a partition member (53), and the upper portion and the lower portion in this center space (50) are divided by the 1st upper air duct (51) and the 2nd lower air duct (52). That is, in the center space (50) of this modification, the 2nd air duct (52) and the 1st air duct (51) are formed by turns [two / every] toward the top from the bottom.

[0060]In the humidity controller (10) of this modification, although not illustrated, eight openings are formed in the outdoor side divider plate (20) and the interior-of-a-room side divider plate (25) at a time.

And by opening and closing the opening and closing shutter provided in each opening, The state where the 1st air duct (51) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 2nd air duct (52) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45), The state where the 2nd air duct (52) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 1st air duct (51) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45) is switched.
[0061]Here, in order to heighten the capability of a humidity controller (10), it is effective to expand the surface area of an adsorbing member (62, 65). However, in order to expand the surface area of an adsorbing member (62, 65), when a fin (64, 67) is lengthened simply, cooling and heating adsorbent become insufficient [the tip part of the fin (64, 67) which is separated from a Peltier device (61)], and there is a possibility that adsorption capability cannot be improved so much as a result.
[0062]On the other hand, with the whole humidity controller (10), the surface area of an adsorbing member (62, 65) can be expanded, without extending the length of a fin (64, 67) in each adsorbing member (62, 65), if the number of the adsorption-and-desorption units (60) provided with an adsorbing member (62, 65) like this modification is increased. Therefore, according to this modification, the capability of a humidity controller (10) can be raised certainly.
[0063]
[Embodiment of the invention 2] Embodiment 2 of this invention changes the composition of an adsorption-and-desorption unit (60) in the humidity controller (10) of the above-mentioned Embodiment 1. Here, a different point from the above-mentioned Embodiment 1 is explained about the humidity controller (10) of this embodiment. in addition -- in explanation of this Embodiment 2 -- "-- upper" -- "-- lower", the "left", and the "right" -- "-- front" -- "-- especially back", "this side", and the "back" mean the thing in the state where all showed drawing 7, unless it refuses.
[0064]As shown in drawing 7, in the humidity controller (10) of this embodiment, an insulating member (54) is provided in the center space (50) in a casing (11). This center space (50) is divided up and down by the insulating member (54). An upper portion constitutes the 1st air duct (51), and the lower portion of the center space (50) divided with the insulating member (54) up and down constitutes the 2nd air duct (52).
[0065]The adsorption-and-desorption unit (60) is constituted in this humidity controller (10) by the refrigerant circuit (70) which circulates a refrigerant and performs a refrigerating cycle. As shown in drawing 9, this refrigerant circuit (70) is a compressor (71), an expansion valve (72) and two heat exchangers, and a closed circuit formed by carrying out piping connection of the four-way switching valve (73), and the inside is filled up with the refrigerant. That is, this refrigerant circuit (70) is constituted like the thing of the air conditioner in which an air conditioning is possible.
[0066]One of these is installed in the 1st air duct (51), and, as for two heat exchangers provided in the above-mentioned refrigerant circuit (70), another side is installed in the 2nd air duct (52). And the heat exchanger installed in the 1st air duct (51) constitutes the 1st adsorbing member (62), and the heat exchanger installed in the 2nd air duct (52) constitutes the 2nd adsorbing member (65).
[0067]each heat exchanger which constitutes an adsorbing member (62, 65) as shown in drawing 8 -- the any -- although -- it is the so-called fin and tube type heat exchanger of a cross fin type. And adsorbent, such as zeolite, is applied to the surface of the fin (76) in each heat exchanger. In each heat exchanger, a refrigerant circulates the inside of the heat exchanger tube (77) which penetrates a fin (76).
[0068]- The humidity controller (10) of an operation operation-book embodiment performs dehumidifying operation like the above-mentioned Embodiment 1 by repeating the 1st operation and the 2nd operation by turns for every predetermined time. Here, operation of the adsorption-and-desorption unit at the time of the 1st operation and the 2nd operation (60) is explained. The flow of the air in the humidity controller (10) of this embodiment to be dehumidified and humidified air is the same as the case of the above-mentioned Embodiment 1.
[0069]First, as shown in drawing 9 (a), in the refrigerant circuit at the time of the 1st operation (70), a four-way switching valve (73) is switched to the state which shows in the figure, the 2nd adsorbing member (65) functions as a condenser, and the 1st adsorbing member (62) functions as an evaporator.
[0070]Concretely, the refrigerant breathed out from the compressor (71) is sent to the 2nd adsorbing member (65). In the 2nd adsorbing member (65), the sent-in refrigerant radiates heat and condenses and adsorbent is heated with this refrigerant. And moisture is desorbed from the heated adsorbent of the 2nd adsorbing member (65), and the moisture from which it was desorbed is given to the humidified air which flows through the 2nd air duct (52).

[0071]After the refrigerant condensed by the 2nd adsorbing member (65) is decompressed by an expansion valve (72), it is sent to the 1st adsorbing member (62). In the 1st adsorbing member (62), the sent-in refrigerant carries out an endothermic, and evaporates and adsorbent is cooled with this refrigerant. In this 1st adsorbing member (62), adsorbent is adsorbed in the moisture in the air which flows through the 1st air duct (51) to be dehumidified. And the endothermic of the heat of adsorption produced in that case is carried out to the refrigerant which flows through the 1st adsorbing member (62). The refrigerant which evaporated in the 1st adsorbing member (62) is inhaled and compressed to a compressor (71).
[0072]Next, as shown in drawing 9 (b), in the refrigerant circuit at the time of the 2nd operation (70), a four-way switching valve (73) is switched to the state which shows in the figure, the 1st adsorbing member (62) functions as a condenser, and the 2nd adsorbing member (65) functions as an evaporator.
[0073]Concretely, the refrigerant breathed out from the compressor (71) is sent to the 1st adsorbing member (62). In the 1st adsorbing member (62), the sent-in refrigerant radiates heat and condenses and adsorbent is heated with this refrigerant. And moisture is desorbed from the heated adsorbent of the 1st adsorbing member (62), and the moisture from which it was desorbed is given to the humidified air which flows through the 1st air duct (51).
[0074]After the refrigerant condensed by the 1st adsorbing member (62) is decompressed by an expansion valve (72), it is sent to the 2nd adsorbing member (65). In the 2nd adsorbing member (65), the sent-in refrigerant carries out an endothermic, and evaporates and adsorbent is cooled with this refrigerant. In this 2nd adsorbing member (65), adsorbent is adsorbed in the moisture in the air which flows through the 2nd air duct (52) to be dehumidified. And the endothermic of the heat of adsorption produced in that case is carried out to the refrigerant which flows through the 2nd adsorbing member (65). The refrigerant which evaporated in the 2nd adsorbing member (65) is inhaled and compressed to a compressor (71).
[0075]
[The embodiment of others of an invention] - It may be made to form a sensible-heat-exchange machine (80) in the interior-of-a-room side space (43) in a casing (11) in the humidity controller (10) of 1st modification-above-mentioned each embodiment, as shown in drawing 10. In this case, in the interior-of-a-room side panel (15) of a casing (11), the position of the interior-of-a-room side outlet (17) and an outdoor side outlet (14) interchanges.
[0076]The above-mentioned sensible-heat-exchange machine (80) is the so-called heat exchanger of a lamination type. Many passages of air to be dehumidified and passages of humidified air are formed in that thickness direction (it is perpendicularly to the space in drawing 10) by turns at this sensible-heat-exchange machine (80). And this sensible-heat-exchange machine (80) carries out heat exchange of the air to be dehumidified after being dehumidified in the adsorption-and-desorption unit (60), and the humidified air before being humidified in an adsorption-and-desorption unit (60).
[0077]Here, during indoor air conditioning, humidified air which is indoor air serves as low temperature comparatively. Then, the cold energy of the humidified air discharged outdoor is collected to the air supplied to the interior of a room to be dehumidified by carrying out heat exchange of air to be dehumidified and the humidified air with a sensible-heat-exchange machine (80).
[0078]- It is also possible to perform not only dehumidifying operation but humidifying operation in the humidity controller (10) of 2nd modification-above-mentioned each embodiment.
[0079]The indoor air incorporated as air to be dehumidified is dehumidified by an adsorbing member (62, 65), and it discharges to outdoor at the same time it supplies the outdoor air which incorporated the humidity controller (10) as humidified air at the time of humidifying operation to the interior of a room with the moisture desorbed from the adsorbent of the adsorbing member (62, 65). A humidity controller (10) repeats the 1st operation and the 2nd operation by turns for every predetermined time at the time of humidifying operation. Here, a different point from the time of dehumidifying operation is explained about the 1st operation and the 2nd operation at the time of humidifying operation.
[0080]In the 1st operation of humidifying operation, by an outdoor side divider plate (20), an outdoor side lower right opening (22) and an outdoor side upper left opening (23) will be in an opening state, and an outdoor side upper right opening (21) and an outdoor side lower left opening (24) will be in eyelid completely closure. In the interior-of-a-room side divider plate (25), the interior-of-a-room side lower right opening (27) and the interior-of-a-room side upper left opening (28) will be in an opening state, and the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower left opening (29) will be in eyelid completely closure. And the 2nd air duct (52) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 1st air duct (51) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left

chamber room (45).
[0081]In an adsorption-and-desorption unit (60), like the time of dehumidifying operation, the 1st adsorbing member (62) becomes the endothermic side of a Peltier device (61), and the 2nd adsorbing element becomes the heat dissipation side of a Peltier device (61).
[0082]The outdoor air which flowed into the outdoor side right chamber room (41) from the outdoor side suction opening (13) is sent into the 2nd air duct (52) as humidified air. In the 2nd air duct (52), the sent-in humidified air contacts the 2nd adsorbing member (65). On the other hand, in the 2nd adsorbing member (65), the adsorbent applied to the surface is heated and moisture is desorbed from the adsorbent. The moisture desorbed from the adsorbent of the 2nd adsorbing member (65) is given to the humidified air which flows through the 2nd air duct (52). The humidified air humidified by the 2nd air duct (52) flows into the interior-of-a-room side right chamber room (44), and is supplied to the interior of a room through the interior-of-a-room side outlet (17).
[0083]The indoor air which flowed into the interior-of-a-room side left chamber room (45) from the interior-of-a-room side suction opening (16) is sent into the 1st air duct (51) as air to be dehumidified. In the 1st air duct (51), the sent-in air to be dehumidified contacts the 1st adsorbing member (62), and the adsorbent of the 1st adsorbing member (62) is adsorbed in the moisture in the air to be dehumidified. On the other hand, the adsorbent applied to the surface is cooled in the 1st adsorbing member (62) that became the endothermic side of a Peltier device (61). And the heat of adsorption produced when the adsorbent of the 1st adsorbing member (62) was adsorbed in moisture is moved to the 2nd adsorbing member (65) by the Peltier device (61). The air dehumidified by the 1st air duct (51) to be dehumidified flows into an outdoor side left chamber room (42), and is discharged through an outdoor side outlet (14) outdoor.
[0084]In the 2nd operation of humidifying operation, by an outdoor side divider plate (20), an outdoor side upper right opening (21) and an outdoor side lower left opening (24) will be in an opening state, and an outdoor side lower right opening (22) and an outdoor side upper left opening (23) will be in eyelid completely closure. In the interior-of-a-room side divider plate (25), the interior-of-a-room side upper right opening (26) and the interior-of-a-room side lower left opening (29) will be in an opening state, and the interior-of-a-room side lower right opening (27) and the interior-of-a-room side upper left opening (28) will be in eyelid completely closure. And the 1st air duct (51) is open for free passage to an outdoor side right chamber room (41) and the interior-of-a-room side right chamber room (44), and the 2nd air duct (52) is open for free passage to an outdoor side left chamber room (42) and the interior-of-a-room side left chamber room (45).
[0085]In an adsorption-and-desorption unit (60), like the time of dehumidifying operation, the 2nd adsorbing member (65) becomes the endothermic side of a Peltier device (61), and the 1st adsorbing element becomes the heat dissipation side of a Peltier device (61).
[0086]The outdoor air which flowed into the outdoor side right chamber room (41) from the outdoor side suction opening (13) is sent into the 1st air duct (51) as humidified air. In the 1st air duct (51), the sent-in humidified air contacts the 1st adsorbing member (62). On the other hand, in the 1st adsorbing member (62), the adsorbent applied to the surface is heated and moisture is desorbed from the adsorbent. The moisture desorbed from the adsorbent of the 1st adsorbing member (62) is given to the humidified air which flows through the 1st air duct (51). The humidified air humidified by the 1st air duct (51) flows into the interior-of-a-room side right chamber room (44), and is supplied to the interior of a room through the interior-of-a-room side outlet (17).
[0087]The indoor air which flowed into the interior-of-a-room side left chamber room (45) from the interior-of-a-room side suction opening (16) is sent into the 2nd air duct (52) as air to be dehumidified. In the 2nd air duct (52), the sent-in air to be dehumidified contacts the 2nd adsorbing member (65), and the adsorbent of the 2nd adsorbing member (65) is adsorbed in the moisture in the air to be dehumidified. On the other hand, the adsorbent applied to the surface is cooled in the 2nd adsorbing member (65) that became the endothermic side of a Peltier device (61). And the heat of adsorption produced when the adsorbent of the 2nd adsorbing member (65) was adsorbed in moisture is moved to the 1st adsorbing member (62) by the Peltier device (61). The air dehumidified by the 2nd air duct (52) to be dehumidified flows into an outdoor side left chamber room (42), and is discharged through an outdoor side outlet (14) outdoor.
[0088]
[Effect of the Invention]In this invention, adsorbent is formed on the surface of an adsorbing member (62, 65), and this adsorbent is directly heated by the adsorbing member (62, 65). For this reason, it becomes possible to heat adsorbent certainly by small quantity of heat, and to desorb moisture from adsorbent compared with the conventional thing which heats adsorbent indirectly using the heated air. Therefore,

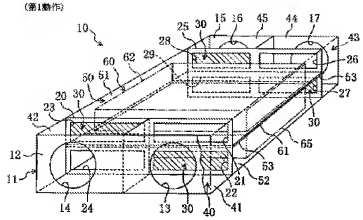
according to this invention, the energies which can reduce the energies which reproduction of an adsorbing member (62, 65) takes, and operation of a humidity controller (10) takes by extension are reducible.
[0089]the adsorbent formed in the surface in the adsorbing member (62, 65) of this invention -- cooling -- **** . For this reason, the heat of adsorption generated when adsorbent is adsorbed in moisture is processed by an endothermic being carried out to an adsorbing member (62, 65). Therefore, according to this invention, the gas conditioning capability of a humidity controller (10) can fully be demonstrated by being able to prevent moisture from becoming adsorbent that it is hard to adsorb, and securing the moisture content which can stick to adsorbent with the generated heat of adsorption.
[0090]According to the invention of claim 2, the whole humidity controller (10) can be formed in a thin shape. Therefore, according to this invention, the humidity controller (10) which can be installed also, for example in narrow space called space under the roof can be realized, and the restrictions at the time of installing a humidity controller (10) can be made small.
[0091]According to the invention of claim 3, heating and cooling of adsorbent in an adsorbing member (62, 65) can be performed only by energizing to a thermoelement (61). Therefore, according to this invention, a reliable humidity controller (10) is realizable.
[0092]According to the invention of claim 5, the air supply to the interior of a room can be dehumidified, performing indoor ventilation. According to the invention of claim 6, the air supply to the interior of a room can be humidified, performing indoor ventilation. Therefore, according to these inventions, gas conditioning of air supply and indoor ventilation can be performed simultaneously, and the indoor amenity can be raised.
[0093]In the invention of claim 7, the sensible-heat-exchange machine (80) is formed in the humidity controller (10) in which indoor ventilation is possible. For this reason, it becomes possible to collect the cold energy under exhaust air to air supply, for example, if it is during indoor air conditioning, or to collect the warm temperature under exhaust air to air supply, if it is during indoor heating. Therefore, according to this invention, it becomes possible to control increase of the sensible heat load accompanying ventilation.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is an outline perspective view showing the state under the composition of the humidity controller in Embodiment 1, and 1st operation.
[Drawing 2]It is an outline perspective view showing the state under the composition of the humidity controller in Embodiment 1, and 2nd operation.
[Drawing 3]It is an outline lineblock diagram showing the state where the humidity controller of Embodiment 1 was seen from the method of right-hand side.
[Drawing 4]It is an outline perspective view showing the composition of the adsorption-and-desorption unit in Embodiment 1.
[Drawing 5]It is an outline lineblock diagram showing the state where the humidity controller of Embodiment 1 was seen from the upper part.
[Drawing 6]It is an outline lineblock diagram showing the state where the humidity controller of the modification 1 of Embodiment 1 was seen from the method of right-hand side.
[Drawing 7]It is an outline perspective view showing the composition of the humidity controller in Embodiment 2.
[Drawing 8]It is an outline perspective view showing the composition of the adsorbing member in Embodiment 2.
[Drawing 9]It is a piping distribution diagram of the refrigerant circuit in Embodiment 2.
[Drawing 10]It is an outline lineblock diagram showing the state where the humidity controller of the 1st modification of other embodiments was seen from the upper part.
[Description of Notations]
(11) Casing
(13) Outdoor side suction opening
(14) Outdoor side outlet
(16) Interior-of-a-room side suction opening
(17) Interior-of-a-room side outlet
(30) Change mechanism

(51) The 1st air duct
(52) The 2nd air duct
(61) Peltier device (thermoelement)
(62) The 1st adsorbing member
(62) The 2nd adsorbing member
(70) Refrigerant circuit
(80) Sensible-heat-exchange machine

【図１】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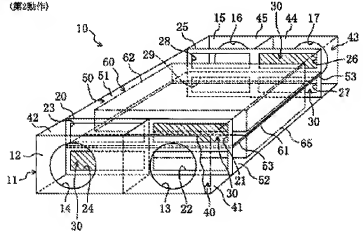
【図２】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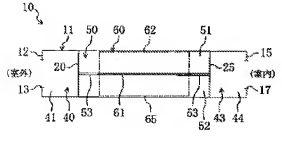
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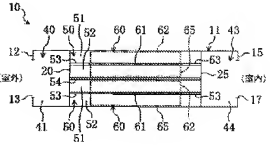
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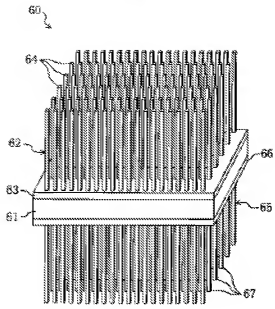
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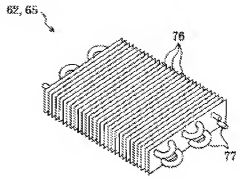
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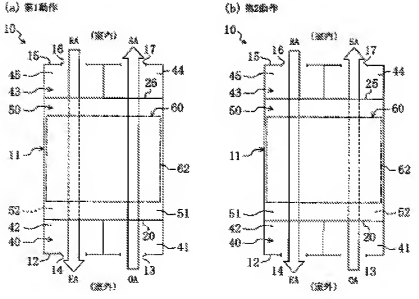
【図５】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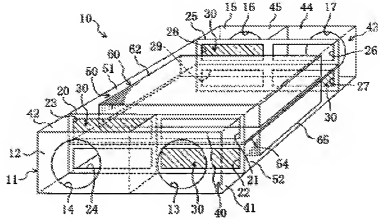
【図７】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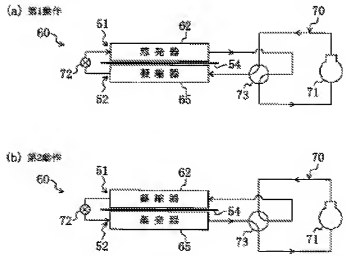
【図９】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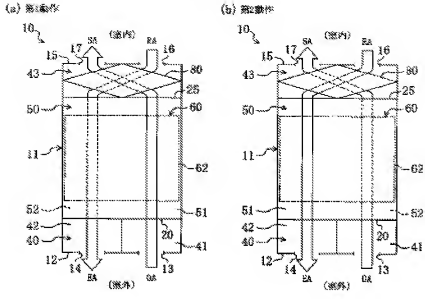
【図１０】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